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We claim:

435/6 CLAIMS
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AV 1655

1. A method for detecting the presence of a target sequence in a nucleic acid sample,
comprising:
 - 5 a) applying an AC input signal to a hybridization complex, wherein said hybridization complex comprises
 - i) a first single stranded nucleic acid containing at least one electron donor moiety and at least one electron acceptor moiety, wherein said electron donor moiety and said electron acceptor moiety are covalently attached to said nucleic acid, wherein one of said electron donor and acceptor moiety is an electrode; and
 - 10 ii) a target single stranded nucleic acid;
 - b) detecting the presence of said target nucleic acid via an output signal characteristic of electron transfer through said hybridization complex.
2. A method for detecting the presence of a target sequence in a nucleic acid sample,
comprising:
 - 15 a) applying an AC input signal to a hybridization complex, wherein said hybridization complex comprises
 - i) a first single stranded nucleic acid containing at least one covalently attached electron donor moiety; and
 - 20 ii) a second single stranded nucleic acid containing at least one covalently attached electron acceptor moiety, wherein one of said electron donor and acceptor moiety is an electrode; and
 - b) detecting the presence of said target sequence via an output signal characteristic of electron transfer through said hybridization complex.
- 25 3. A method according to claim 1 or 2 wherein at least one of said electron donor moiety and said electron acceptor moiety is a transition metal complex.
4. A method according to claim 1 or 2 wherein at least one of said electron donor moiety and said electron acceptor moiety is an organic electron transfer moiety.
5. A method according to claim 1 or 2 further comprising receiving output signal by
30 applying input signal at a plurality of frequencies.

6. A method according to claim 1 or 2 wherein said output signal comprises a current.
7. A method according to claim 1 or 2 wherein said output signal is time delayed as compared to said input signal.
8. A method according to claim 1 or 2 wherein said electron donor and acceptor moieties are covalently attached to a ribose of the ribose-phosphate backbone.
9. A method according to claim 1 or 2 wherein said electron donor and acceptor moieties are covalently attached to a phosphate of the ribose-phosphate backbone.
10. A method according to claim 1 or 2 wherein said electron donor and acceptor moieties are covalently attached to a terminal base.
- 10 11. A method for detecting the presence of a target sequence in a nucleic acid sample, comprising:
- a) applying an AC input signal at a first frequency to a hybridization complex, wherein said hybridization complex comprises
- i) a first single stranded nucleic acid containing at least one electron donor moiety and at least one electron acceptor moiety, wherein said electron donor moiety and said electron acceptor moiety are covalently attached to said nucleic acid, wherein one of said electron donor and acceptor moiety is an electrode; and
- ii) a target single stranded nucleic acid;
- b) applying an AC input signal at at least a second frequency to said hybridization complex;
- c) detecting the presence of said target sequence via an output signal characteristic of electron transfer through said hybridization complex.

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